

Notice of Allowability

Application No.

09/776,080

Examiner

Chat C. Do

Applicant(s)

HSU ET AL.

Art Unit

2193

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 02/28/2005.
2. ☒ The allowed claim(s) is/are 1,3,6-11,14-19,21 and 22.
3. ☒ The drawings filed on 01 February 2001 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|---|--|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892) | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 6. <input checked="" type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date <u>attached</u> . |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date _____ | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 8. <input type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| | 9. <input type="checkbox"/> Other _____ |

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Noel B. Kivlin on 03/21/2005.

The application has been amended claims 17 and 19 to avoid non-statutory subject matter as follows:

Claim 17. A ~~carrier~~ storage medium comprising software instructions executable by a microprocessor having an instruction set that includes single-instruction multiple-data (SIMD) floating point instructions to implement a method of performing a two-dimensional discrete cosine transform (DCT), wherein the method comprises: receiving a two-dimensional block of integer data having C columns and R rows, wherein each of the R rows contains a set of C row data values, wherein the block of integer data is indicative of a portion of an image, wherein each of C and R is an even integer, and for each row, loading the entire set of C row data values registers of the microprocessor; of the row into a set of C/2 converting the C row data values into floating point form, wherein each of the registers holds two of the floating point row data values, wherein said converting is accomplished using a packed integer word to floating-point conversion (pi2fw) instruction; and performing a plurality of weighted-rotation operations on the values in

the registers, wherein the weighted-rotation operations are performed using SIMD floating point instructions; altering the arrangement of values in the registers; performing a second plurality of weighted-rotation operations on the values in the registers; again altering the arrangement of the values in the registers; performing a third plurality of weighted-rotation operations on the values in the registers; yet again altering the arrangement of the values in the registers; and performing a fourth plurality of weighted-rotation operations on the values in the registers to obtain C intermediate floating point values; and storing the C intermediate floating point values into a next available row of an intermediate buffer.

Re claim 19. A ~~earlier~~ storage medium comprising software instructions executable by a microprocessor having an instruction set that includes single-instruction multiple-data (SIMD) floating point instructions to implement a method of performing a discrete cosine transform (DCT), wherein the method comprises: receiving a two-dimensional block of integer data having C columns and R rows, wherein the two-dimensional block represents a portion of an image; and for two columns at a time, loading column data from the two columns into registers of the microprocessor so that each of the registers holds one value from a first of the two columns and one value from a second of the two columns, wherein the one value from the first of the two columns and the one value from the second of the two columns are taken from the same row of the two-dimensional block; converting the column data into floating point form; and performing a plurality of weighted-rotation operations on the values in the registers, wherein the weighted-rotation operations for the two columns are performed in parallel

using SIMD floating point instructions, wherein said weighted-rotation operations are accomplished using a packed floating-point multiplication (pfmul) instruction, a packed floating-point subtraction (pfsb) instruction and a packed floating-point addition (pfadd) instruction; as each weighted-rotation operation is done, storing weighted-rotation operation results to an intermediate buffer.

2. Claims 1, 3, 6-11, 14-19, and 21-22 are allowed.
3. Claims 2, 4-5, 12-13, and 20 are cancelled.
4. The following is an examiner's statement of reasons for allowance:

The prior art of records fails to disclose or render an obviousness of a method of performing a two-dimensional discrete cosine transform using a microprocessor having an instruction set that includes SIMD floating-point instructions comprising: receiving block of integer data, for each row loading the entire set of C row data values of the row into a set of C/2 registers; converting the C row data values into floating point form wherein each converting is accomplished using a packed integer word to floating-point conversion (pi2fw) instruction; and performing weighted-rotation operations as cited in independent claims 1 and 16-17; and for two columns at a time wherein the weighted-rotation operations are accomplished using a packed floating-point multiplication (pfmul) instruction, a packed floating-point subtraction (pfsb) instruction and a packed floating-point addition (pfadd) instruction as cited in independent claims 11 and 18-19.

The closest found prior art is Horton (U.S. 6,421,696). Horton discloses a system and method for high speed execution of discrete transform utilizing SIMD instructions on a general purposes comprising receiving data; converting the row data values from integer into floating point and performing weighted-rotation operations. However, Horton fails to disclose for each row, the converting is accomplished using a pi2fw instruction and for two columns at a time the weighted-rotation operations are accomplished using a packed floating-point multiplication (pfmul) instruction, a packed floating-point subtraction (pfsb) instruction and a packed floating-point addition (pfadd) instruction.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chat C. Do whose telephone number is (571) 272-3721. The examiner can normally be reached on M => F from 7:00 AM to 5:30 PM.

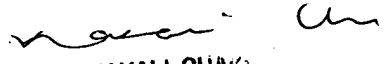
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chaki Kakali can be reached on (571) 272-3719. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2193

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chat C. Do
Examiner
Art Unit 2193

March 22, 2005


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